

ABSTRACT

Introduction

Lyme disease is sometimes called Lyme borreliosis. It is the most common multi-system, chronic, multiform infectious disease.

Lyme borreliosis occurs in North America, Europe, and Asia, and it is closely related to the occurrence and concentration of ticks in the genus *Ixodes*. Depending on the continent, different types of these arachnids in different locations. Europe is dominated by ticks in the genus *Ixodes ricinus*, Asia – *Ixodes persulcatus*, while North America is dominated by *Ixodes scapularis* ticks. Lyme borreliosis is a seasonal disease caused by the activity of ticks whose lifestyle is closely correlated with climatic conditions. There are two peaks of the maximum activity of these arachnids in our climate zone: the first one is May and June, and the other precedes the winter season, which begins at the turn of September and October and continues until the beginning of November.

Ticks are included in the phylum Arthropoda, subphylum Chelicerata, class Arachnida, subclass Acari, and order Ixodida.

Borrelia burgdorferi spirochetes are carried by *Ixodes* ticks. The clinical picture of these arthropods is associated with inflammatory conditions in the skin, joints, nervous system, and heart. 19 species of spirochetes were indicated, which form the *Borrelia burgdorferi* sensu lato complex, and which can be found at wild animals and are carried by ticks. From among them, such pathogenic for humans microorganisms as *Borrelia burgdorferi* sensu stricto, *Borrelia garinii*, and *Borrelia afzelii* were described.

The first assumptions that a bite by a tick may be related to the appearance of some symptoms date back to the beginning of the 20th century. In 1909, a Swedish dermatologist Arvid Afzelius was the first one who examined the correlation between the occurrence of erythema migrans and a tick bite. He presented the results of his research in a meeting of the Swedish Society of Dermatology. In 1975, Lyme disease was diagnosed in the vicinity of the city of Lyme in the United States.

In 1982, Willy Burgdorfer, Ph.D. isolated *Borrelia burgdorferi* from a tick on the US East Coast. It was only he who proved the connection between a tick bite and the occurrence of the disease.

Since 1996, physicians in Poland have been obliged to report cases of Lyme disease to state sanitary and epidemiological stations. The number of reported cases of Lyme disease is systematically growing each year. According to the data provided by the National Institute of

Hygiene, 12,773 cases of the disease were reported in Poland in 2013, and 20,150 cases of Lyme disease were annotated in 2018. In our country, the endemic areas for Lyme disease are the region of Warmia and Mazury, Podlasie, and the area of Lower Silesia. It is estimated that in some Northeast regions of Poland, 30% of the tick population is infected with pathogens causing Lyme disease.

The aims of the paper

The aim of the paper was to analyze the incidence of Lyme disease in children from the Warmian-Masurian Voivodeship, who were hospitalized in the Provincial Specialist Children's Hospital in Olsztyn in the years 2013-2018.

Material and research methods

The research group were 109 patients with diagnosed Lyme disease, who were hospitalized in the hospital. The research project was carried out using a retrospective method based on an analysis of the medical history of patients admitted to the hospital in the period from 1st January 2013 to 31st December 2018. The research tool was the author's data collection sheet containing grouped questions on statistical data of the patients.

The statistical calculations were carried out with the help of the package TIBCO STATISTICA 13.3PL. The empirical material was subjected to statistical analysis using descriptive statistics like: a chi-square test, t-Student test, and ANOVA test. The quantitative data was described by N- number of cases, \bar{x} - arithmetic mean (-95%,+95%) of the confidence interval, Me- median value, Min- minimum, Max- maximum, Q1- lower quartile, Q3- upper quartile, and SD- standard deviation. The data was categorized and described by N- number of cases, and %- percentage in the group. A chi-square test (χ^2) was used for the analysis of uniformity of variable distribution. A t-Student test (t) was used for the analysis of the significance of differences for the mean in two groups. An ANOVA test (F) was used for the analysis of the significance of differences for the mean in several groups. The Pearson correlation was used for the analysis of a correlation between variables of the number of hospitalizations and incidence. The significance level was set at $p < 0.05$.

Results

109 patients aged from 3 to 18 years were qualified for the study. The group included 29.63% of male patients and 70.64% of female patients. Half of the analyzed patients were aged from 9 to 15 years. The average age in the study group of patients was 11.7 ± 4 years

with the median of 12 years. The average age of the male children was 11.8 ± 3.9 years with the median of 13 years, and for the female children, it was 11.6 ± 4.1 with the median of 12 years. The place of residence of the patients in the study group was as follows, more than half (52.29%) lived in the city, while the rest of the patients (47.71%) lived in the country. In the study, more than half of the patients (56.88%) had a scheduled admission to hospital, while 43.12% were urgent admissions to hospital. 87.16% of the patients reported one symptom in the initial diagnosis. A group of 7.34% of the patients reported two symptoms, and 5.5% of the patients reported three symptoms. The most patients in the study group complained of headaches (68.81%). 29.36% of the patients experienced dizziness, and about every fifth patient (20.18%) had joint pain. Pain in limbs was reported by 9.17%, joint swelling by 7.34%, and muscle aches by 6.42%; facial nerve palsy was reported by 8.26% of the patients, and 11.93% of the children had skin changes. The pain scale was described in six groups determining the severity of pain. The most patients in the study group (35.78%) described their pain as moderate, and 30.28% as mild. Severe pain was reported by 16.51% of the patients, while 8.26% of the children declared no pain. A group of 6.42% described their pain as very severe, while the least of the patients (2.75%) had unbearable pain. The first symptoms appeared in about 54.13% of the patients in the study group in less than 3 months. The first symptoms appeared in about every fourth patient (23.85%) in the period from 4 to 6 months before the disease was diagnosed. The first symptoms appeared in a group of 14.68% of the patients in the period 7-12 months. The first symptoms appeared in a group of 2.757% of the patients within the period of 13-24 months. The first symptoms appeared in a group of 3.67% of the patients from 25 to 36 months. The first symptoms appeared in a group of 0.92% of the patients more than 36 months before hospitalization. About three quarters of the patients in the study group (74.31%) had no conscious contact with a tick. On the other hand, every fourth patient (26.69%) reported a previous contact with a tick. Next, the cases with a registered tick bite ($n=28$) were analyzed. A bite to the head was registered in about half of the cases (42.86%). Every fourth patient (25%) had a bite to the torso. Likewise, every fourth bitten patient had a registered bite to a lower limb, which also amounts to 25% of the cases. A tick bite to an upper limb was registered in 7.14% of the cases.

Conclusions

1. Among the hospitalized patients with a diagnosis of Lyme disease, female children in school age and coming from urban areas were much more often affected.
2. 74.31% of the patients hospitalized due to Lyme disease denied having contact with a tick.
3. The patients with a diagnosed *Borrelia burgdorferi* spirochete infection were mainly admitted to hospital in an emergency.
4. The level of felt pain affected the mode of admission to hospital; children with a higher felt pain level than 5 degrees were more often admitted to hospital in an emergency.
5. The average age of the patients admitted to hospital with the level of felt pain in the range of 5-10 degrees was higher than in the children who declared the level of felt pain in the range of 0-4 degrees, while the gender of the patient did not affect the level of felt pain.
6. The majority of the patients (88.07%) who were hospitalized in the study period reported non-specific symptoms of Lyme disease.
7. One disease symptom was significantly more frequent in the children who complained of limb or muscle pain during admission to hospital, while the children with skin changes significantly more often had several disease symptoms.
8. The time between the onset of the first disease symptoms and diagnosing Lyme disease was significantly shorter in the children under the age of seven.
9. For 54.13% of the patients, the time between the onset of the first symptoms and diagnosing the disease was up to 3 months.
10. The hospitalization time of the children under the age of seven was significantly shorter than in other age groups.

